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CONFIRMATION

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Please Reply to Southampton

GML2086/MEC

31 May 2001

Dear Sir

**International PCT Patent Application No. PCT/GB00/02159
(Claiming Priority from GB 9913705.1 of University of Southampton)
of Powertile Limited**

With reference to the written opinion of 5 March 2001 we enclose new claims pages 11 to 14 to replace present pages 11 to 13, and a certified translation of D1, JP-A-10-88740 to replace the (very poor) computer translation referred to by the examiner.

The claims have been amended to incorporate reference numerals.

It is submitted that there is no disclosure in D1 of a plug and socket connection that is made by bringing together the outer panel and the inner support structure, as claimed in applicant's claim 1.

In Figure 3 of D1 there is, indeed, an electrical socket 17 provided on the inner support structure 12a, but there is no teaching that plug 18 is rigidly carried by the outer panel 14. Rather, it would appear that plug 18 is provided on a short lead, and it would be necessary for the installer to manually insert plug 18 into socket 17.

Paragraphs [0013] and [0014] of the certified translation deal with the connection of plugs 18 and sockets 17. It is submitted that there is no clear teaching in those paragraphs that the plugs 18 will automatically connect with the sockets as the outer panel is brought to the assembled position.

Paragraph [0014] states that the 'plugs 18 can easily be connected with the above-mentioned electrical points 17 at the same time as the solar cell 14 is installed'. This is consistent with the plugs 18 being provided on short leads. The sockets 17 are accessible as the outer panel is brought towards the assembled position, but there is no statement that the plugs 18 will connect.

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The applicant's invention of providing automatic connection of the plug and socket connections has important advantages in use that are not provided by the arrangement of D1. As stated in paragraph [0014] of D1 it is possible to connect plug 18 and socket 17 on installation of the outer panel. This is easy to carry out as the roof is being tiled, because the practice is to put the tiles on the lower part of the roof and then to work up the roof, laying new tiles to overlap the existing tiles.

The problem with D1 is that it will not be easy to remove the outer panel of a solar tile on a fully tiled roof because it will be difficult to get access to the plugs 18. The applicant's arrangement, on the other hand, achieves automatic disconnection of the plugs and sockets simply by disconnecting the outer panel from the inner support structure.

It is therefore submitted that D1 does not disclose the invention of the applicant's claims. It is further submitted that the applicant's claims are inventive over D1.

Yours faithfully



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3rd April 2001

Your ref. no: 210-8723

I, **Susan Jane Gaulter, M.I.T.I.**, working on behalf of Colrick & Associates Limited of Hethe Place, Hartfield Road, Cowden, Nr. Edenbridge, Kent TN8 7DZ, hereby declare that I am fully conversant with the Japanese and English languages and that the attached is a true and complete translation of the document in respect to Unexamined Patent No. 10-88740.

Signed: S.J. Gaulter

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(54) [Title of Invention] Roofing Tile with Solar Cell

(57) [Abstract]

[Problem] To provide a roofing tile with solar cell in which the wiring of the solar cell connecting cable is easy to perform, and also in which the solar cell or the tile itself alone is individually exchangeable, and this exchange process is simple to perform.

[Means for resolving] This is a roofing tile with solar cell 10 formed by inserting solar cell 14 into a concave section 13 provided in the centre of the surface of a flat tile 11, in which the connecting cables 16 are buried through from the inner edge to the outer edge of the upper surround 12a which intersects at right angles with the flow incline of the above-mentioned flat tile 11; and also in which the electrical points 17 connected to the cable ends are exposed on the inner edge of the above-mentioned surround, and plugs 18 on the solar cell 14 can be connected to these electrical points 17.

[Scope of Claims]

[Claim 1] A roofing tile with solar cell formed by installing a solar cell in a concave section provided in the centre of the surface of a flat tile, characterised by the burial of the connecting cables through from the inner edge to the outer edge of the upper surround which intersects at right angles with the flow incline of the above-mentioned flat tile; and also by the exposure on the inner edge of the above-

mentioned surround of the electrical points connected to the cable ends, and the ability to connect the plugs on the solar cell to these electrical points.

[Detailed Description of the Invention]

[0001]

[Technical Field to which Invention Belongs] The invention relates to a roofing tile with solar cell.

[0002]

[Prior Art] Various solar cell application methods have previously been devised for the purpose of reducing the amount of electricity consumed by installing solar cells in the roof of dwellings etc. and using the energy possessed by sunlight to supplement basic electricity consumption.

[0003] For example, Unexamined Patent Gazette No. 57-68454 and Unexamined Utility Patent Gazette No. 4-28524 describe a method for embedding a solar cell in a roofing tile and tiling a roof with this roofing tile. In addition Unexamined Patent Gazette No. 5-243598 describes a method for using a panel-shaped solar cell unit by fixing it to a special stand.

[0004]

[Problems to be Resolved by Invention] Nevertheless, the method described in the latter example given above, Unexamined Patent Gazette No. 5-243598, in which a solar cell unit is used by fixing it to a special stand, has the problem that the construction work on the roof involves complex waterproofing of the joints in the peripheral roofing material other than the above-mentioned solar cell unit, which requires many manhours and is costly.

[0005] In addition, although the roofing tile in which a solar cell is embedded as described in the former cases, the Unexamined Patent Gazette No. 57-68454 and Unexamined Utility Patent Gazette No. 4-28524, has the merit that since the tiling can be carried out with a similar method to that for the basic roofing tile, the work time is unchanged and the construction work can be carried out simply and at reasonable cost, as described in the Unexamined Patent Gazette No. 57-68454 and Unexamined Utility Patent Gazette No. 4-28524, the construction in which the terminal of the solar cell connecting cable is fed through the rear of the roofing tile has the problem of waterproofing against rainwater etc. seeping in from this feedthrough part.

[0006] Furthermore, as described in Unexamined Utility Patent Gazette No. 4-28524, since the method of fixing a solar cell to a roofing tile with adhesive does not allow individual exchanges of the solar cell or the roofing tile, the exchange of the roofing tile with solar cell itself is costly and there are maintenance problems.

[0007] This invention has focused on the problems referred to above, and its aim is to solve these problems and to provide a roofing tile with solar cell in which the wiring of the solar cell connecting cable is easy to carry out, and also in which only the solar cell or tile itself is individually exchangeable, and this exchange process is simple to perform.

[0008]

[Means for resolving the problems] This invention, the roofing tile with solar cell, is a roofing tile with solar cell formed by installing a solar cell in a concave section provided in the centre of the surface of the flat tile, characterised by the burial of the

connecting cables through from the inner edge to the outer edge of the upper surround which intersects at right angles with the flow incline of the above-mentioned flat tile; and also by the exposure on the inner edge of the above-mentioned surround of the electrical points connected to the cable ends, to which the plugs on the solar cell can be connected.

[0009]

[Action] In this invention, the roofing tile with solar cell, since the connecting cables are buried through from the inner edge of the upper surround which intersects at right angles with the flow incline of the flat tile, and also since the electrical points connected to the cable ends are exposed on the inner edge of the above-mentioned surround, and the solar cell plugs can be connected to these electrical points, the solar cell can be installed in the concave section of the flat tile at the same time as connecting the solar cell plugs to the electrical points on the flat tile.

[0010] In other words, the construction method which may be used for this roofing tile with solar cell is firstly to lay the flat tiles and wire the connecting cables between the adjoining flat tiles, and then to install the solar cell in the concave section. In addition, since exchanges due to damage to the solar cell or flat tile can be performed individually and simply on either, unlike previous roofing tiles with solar cells, this one is economical allowing cost savings.

[0011] Furthermore, since this invention, the roofing tile with solar cell, is constructed by providing a concave section in a traditional flat tile and integrating a solar cell into this concave section, the same method of tiling as for the traditional flat tile may be used, and partial tiling where necessary with this roofing tile with solar cell will enable solar energy to be used often, simply and at reasonable cost.

[0012]

[Working shape of invention] Diagram 1 is the exploded oblique view of one example of this invention, the roofing tile with solar cell, Diagram 2 is the rear oblique view of the roofing tile with solar cell, and Diagram 4 is the oblique view of the roofing tile with solar cell. The working example of the roofing tile with solar cell 10 is constructed by providing a concave section 13 within the surround 12 which forms a polymerised unit overlaid on the surface of the flat tile when tiling, and installing a solar cell 14 in this concave section.

[0013] As shown in the cross-section Diagram 3, connecting cables 16 are buried in the upper surround 12a which intersects at right angles with the flow incline of the above-mentioned flat tile 11, through from the inner edge to the outer edge; and the electrical points 17 connected to the ends of these connecting cables 16 are exposed on the inner edge of the above-mentioned surround 12a.

[0014] Therefore, plugs 18, provided on the edge of solar cell 14, can easily be connected with the above-mentioned electrical points 17 at the same time as the solar cell 14 is installed. Further, the interfaces for the above-mentioned plugs 18 and the electrical points 17 are located in the groove provided on the edge of concave section 13, and care has been taken to ensure that they do not interfere when installing solar cell 14.

[0015] Therefore, in this working example of a roofing tile with solar cell 10, the construction method which may be used for this roofing tile with solar cell, as shown in Diagram 5, is firstly to lay the flat tiles and wire the connecting cables 16 and 16 between the adjoining flat tiles 11 and 11, and then to install the solar cell 14 in the concave section 13. In addition, since exchanges due to damage to the solar cell 14 or

flat tile 11 can be performed individually and simply on either, unlike previous roofing tiles with solar cells, this one is economical allowing cost savings.

[0016] Furthermore, since this invention, the roofing tile with solar cell 10, is constructed by providing a concave section 13 in a flat tile 11 which is equivalent to the traditional flat tile 1, and integrating a solar cell 14 into this concave section 13, the same method of tiling as for the traditional flat tile may be used, and partial tiling where necessary with these roofing tiles with solar cell will enable solar energy to be used often, simply and at reasonable cost.

[0017]

[Benefit of Invention] In this invention, the roofing tile with solar cell, since the connecting cables are buried through from the inner edge of the upper surround which intersects at right angles with the flow incline of the flat tile; and also since the electrical points connected to the cable ends are exposed on the inner edge of the above-mentioned surround, and the solar cell plugs can be connected to these electrical points, the solar cell can be installed in the concave section of the flat tile at the same time as connecting the solar cell plugs to the electrical points on the flat tile.

[0018] In other words, the construction method which may be used for this roofing tile with solar cell is firstly to lay the flat tiles and wire the connecting cables between the adjoining flat tiles, and then to install the solar cell in the concave section. In addition, since exchanges due to damage to the solar cell or flat tile can be performed individually and simply on either, unlike previous roofing tiles with solar cells, this one is economical allowing cost savings.

[0019] Furthermore, since this invention, the roofing tile with solar cell, is constructed by providing a concave section in a traditional flat tile and integrating a solar cell into this concave section, the same method of tiling as for the traditional flat tile may be used, and partial tiling where necessary with these roofing tiles with solar cell will enable solar energy to be used often, simply and at reasonable cost. Therefore, it is ideal as a roofing tile with solar cell.

[Brief Explanation of Drawings]

[Diagram 1] Exploded oblique view showing an example of this invention, the roofing tile with solar cell.

[Diagram 2] Oblique rear view of roofing tile with solar cell.

[Diagram 3] Cross-section of the main part of the roofing tile with solar cell.

[Diagram 4] Oblique view of roofing tile with solar cell.

[Diagram 5] Oblique view showing an example of the construction of this invention, the roofing tile with solar cell.

[Explanation of Numerical Codes]

- 1 (traditional) flat tile
- 10 roofing tile with solar cell
- 11 flat tile
- 12 surround
- 12a upper surround
- 13 concave section
- 13a groove
- 14 solar cell
- 16 connecting cable
- 17 electrical point
- 18 plug

[Diagram 1]

[Diagram 2]